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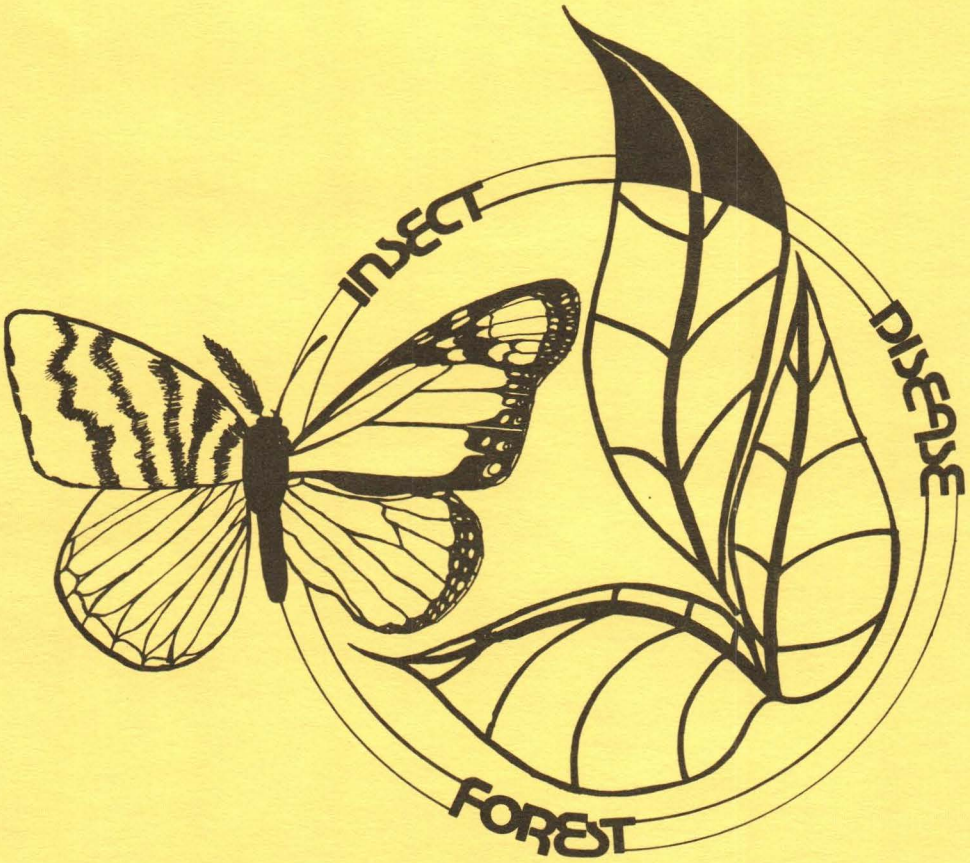
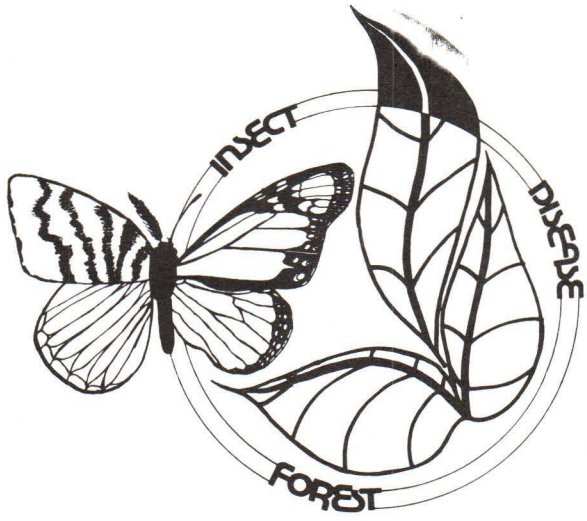
MISSOURI FOREST PEST REPORT 1985



Missouri Department of CONSERVATION

Forestry Division

MISSOURI FOREST PEST REPORT



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INSECTS OBSERVED IN 1985 - DISCUSSED IN REPORT

1. Agrilus Twig Borer, Agrilus sp.
2. Black Turpentine Beetle, Dendroctonus terebrans, (Oliv.)
3. Bronze Birch Borer, Agrilus anxius, (Gory)
4. Carpenterworm, Prionoxystus robiniae, (Peck)
5. Cottonwood Borer, Plectrodera scalator, (F.)
6. Cottonwood Leaf Beetle, Chrysomela scripta, (F.)
7. Cottonwood Twig Borer, Gypsonomia haimbachiana, (Kft.)
8. Eastern Tent Caterpillar, Malacosoma americanum, (F.)
9. European Pine Sawfly, Neodiprion sertifer, (Geoff.)
10. Evergreen Bagworm, Thyriodopteryx ephemeraeformis, (Haw.)
11. Fall Webworm, Hyphantria cunea, (Drury)
12. Gall Insects
13. Gypsy Moth, Porthetria dispar, (L.)
14. Ips Beetle, Ips sp.
15. Kermes Scale, Kermes pubescens (Bogue)
16. Loblolly Pine Sawfly, Neodiprion taedae linearis, (Ross.)
17. Looper Complex
18. Nantucket Pine Tip Moth, Rhyacionia frustrana, (Comstock)
19. Pales Weevil, Hylobius pales, (Hbst.)
20. Periodical Cicada, Magicicada septendecium, (L.)
21. Pine Needle Scale, Phenacaspis pinifoliae, (Fitch)
22. Pine Tortise Scale, Toumeyella numismatica, (P. & McD.)
23. Poplar Tent Maker, Ichthyura inclusa, (Hbn.)
24. Red Oak Borer, Enapholodes rufulus, (Haldeman)
25. Redheaded Pine Sawfly, Neodiprion leconte, (Fitch)

26. Spider Mites, Oligonychus spp. and Tetranychus spp.
27. True Tree Grasshopper, Dendrotettix quercus, (Pack.)
28. Two-Lined Chestnut Borer, Agrilus bilineatus, (Web.)
29. Walnut Caterpillar, Datana integerrima, (G. & P.)

INSECTS OBSERVED IN 1985 - NOT DISCUSSED IN REPORT

1. Asiatic Oak Weevil, Cyrtepistomus castaneus, (Roelofs)
2. Bald-faced Hornet, Vespula maculata, (Linn.)
3. Boxelder Bug, Leptocoris trivittatus, (Say)
4. Carpenter Bee, Xylocopa virginica, (Linn.)
5. Cicada Killer Wasp, Sphecius speciosus, (Drury)
6. Elm Leaf Beetle, Pyrrhalta luteola, (Mueller)
7. Eyed Click Beetle, Alaus oculatus, (Linn.)
8. June Beetle, Phyllophaga sp.
9. Lace Bug, Corythucha ciliata, (Say)
10. Mourning Cloak Butterfly, Nymphalis antiopa, (Linn.)
11. Obscure Scale, Melanaspis obscura, (Comstock)
12. Potter's Wasp, Eumenes fraternus, (Say.)
13. Twig Girdler, Oncideres cingulata, (Say)
14. Twig Pruner, Elaphidionoides villosus (Fabricius)
15. Walking Stick, Diapheromera femorata, (Say)
16. Wheel Bug, Arilus cristatus, (Linn.)

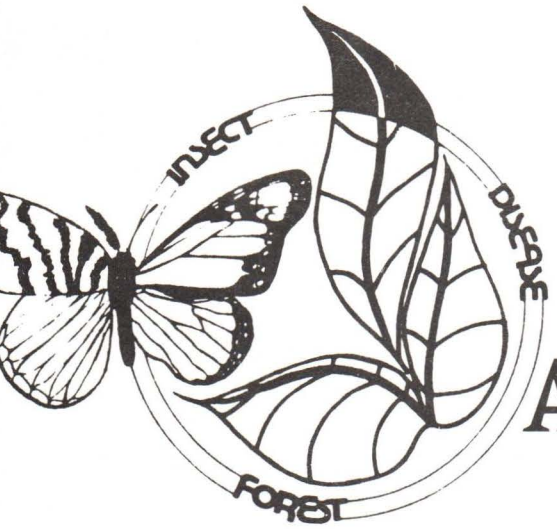
DISEASES OBSERVED IN 1985 - DISCUSSED IN FOREST AND ORNAMENTAL TREE DISEASE SECTION

1. Actinopelte Leaf Spot of Oak, Actinopelte dryina (Sacc.)Hoehn
2. Diplodia Blight, Sphaeropsis sapinea (Fr.) Dyko & Sutton
3. Dutch Elm Disease, Ceratocystis ulmi (Buism.) C. Moreau
4. Hypoxylon Canker of Oak, Hypoxylon atropunctatum (Schw. ex. Fr.) Cke.
5. Oak Decline, weather and various secondary agents
6. Oak Wilt, Ceratocystis fagacearum (Bretz) Hunt
7. Pine Wilt Disease, Bursaphelenchus xylophilus (Steiner and Buhrer) Nickle

OTHER DISEASES OBSERVED IN 1985

1. Anthracnose (Ash), Gloeosporium aridum Ell. & Holw.
   (Hickory), Gnomonia caryae Wolf
   (Maple), Gloeosporium apocryptum E. & E.
   (Oak), Gnomonia quercina Kleb.
2. Ash Decline, unknown
3. Black Knot of Plum and Cherry, Dibotryon morbosum (Schw.) Th. & Syd.
4. Bleeding Canker, Phytophthora cactorum (Leb. & Cohn) Schr.
5. Brown-Spot Needle Blight, Scirrhia acicola (Dearn.) Siggers
6. Chlorosis of Pin Oak and Sweetgum, probably iron/manganese deficiency
7. Chlorotic Dwarf of Eastern White Pine, air pollution
8. Coryneum Twig Blight of Oak, Coryneum sp.

9. Cyclaneusma Needlecast (Naemacylus Needlecast) - Cyclaneusma minus (Butin) DiCosmo, Peredo and Minter
10. Dothistroma Needle Blight, Dothistroma pini Hulbarry
11. Fireblight, Erwinia amylovora (Burr.) Winsl.
12. Frost Injury, weather
13. Gymnosporangium Branch Swelling on Eastern Red Cedar, Gymnosporangium nidus-avis Thaxter
14. Kabatina Blight, Kabatina juniperi Schneider & Arx
15. Maple Leaf Blister, Taphrina carveri Jenk.
16. Maple Decline, unknown
17. Nectria Cinnabarina Canker, Nectria cinnabarina Tode ex Fr.
18. Needle Tip Burn of Eastern White Pine, air pollution
19. Oak Leaf Blister, Taphrina caerulescens (Mont. & Desm.) Tul.
20. Phomopsis Blight, Phomopsis juniperovora Hahn
21. Phyllosticta Leaf Spot of Maple, Phyllosticta minima (B. & C.) E. & E.
22. Rhizosphaera Needlecast, Rhizosphaera Kalkhoffii Bub.
23. Sapsucker Injury, yellow-bellied sapsucker (Sphyrapicus varius)
24. Steganosporium Canker of Maple, Steganosporium sp.
25. Tar Spot, Rhytisma acerinum Pers. ex. Fr.



Insect and Disease ANNUAL REPORT

Forestry Division

INTRODUCTION

With one relatively mild winter, 1984-1985, and a moderately wet spring, summer and fall; our Missouri forests this year are growing well once again. For the last ten years Missouri's forests have suffered from long periodic droughts. Watering of selected urban trees was necessary to prevent them from dying. Trees are always under stress from lack of soil elements, cold, heat and lack of moisture. Our forests are in relatively good condition going into winter 1985-1986.

Tree mortality is a natural phenomenon in the forest as it is in the urban setting. Dying trees on lawns and lots are even expected because man has indirectly been responsible for their decline. Soil compaction, soil removal, use of herbicides and girdling of shrubs and trees with mechanized equipment are common reasons why trees die.

Department personnel were very busy servicing forest pest inquiries this year. Numerous insect and disease occurrences created problems for owners of forest trees, foresters, Christmas tree producers and anyone else involved with growing trees. There were several major insect and disease problems which consumed much time of Forest Pest Specialists and Forest District personnel.

January and February were very cold. Spring was early and part of the summer was dry but not considered a drought. When autumn began so did periodic rains to replenish the subsoil moisture supply.

Some trees are still dying from the earlier droughts, however, with the additional rainfall we should be seeing less tree mortality caused by drought.

Included in this report are pests that have caused damage to forest and urban trees during 1985. Some of the insects and diseases reduce the ornamental value of trees, while others cause log and lumber degrade and timber loss.

We served a great variety of inquiries involving insect and disease identification. Forest Pest Specialists and Forest District Personnel are receiving more inquiries each year because more people are becoming aware of pest problems on their trees and of our Pest Management Program.

In 1985 we saw more different insect and disease problems than in 1984. Some of the major problems in 1984 were not even news worthy in 1985.

Many disease problems developed during the growing season due to a cool, wet spring. During this period as well as through the remainder of the summer, conditions were ideal for the development and spread of fungi which infect leaves, needles and stems. Various tree diseases cropped up during the entire growing season.

THE PROGRAM

In 1962, a cooperative program, the Forest Pest Control Program, was entered into with the U.S. Forest Service by the Forestry Division, Missouri Department of Conservation. Under the original agreement the effort is designed to detect, evaluate and control forest insects and diseases on state and private land. Department Foresters and other personnel report occurrences of damaging insects and diseases. Forest Pest Management specialists coordinate the program.

Insects, diseases and drought, can cause damage to trees and shrubs which may go unnoticed until mortality occurs. Tree losses occur on an annual basis in the forest from hardwood borers; pine cambial feeders; defoliating insects; root, canker and stem diseases; and drought.

Trees under stress were vulnerable to attack by insect borers, and a host of canker fungi and root rot fungi. Some factors which stress trees are drought, compacted soil, root disturbance, lightning strike, insufficient soil elements and wet or dry soil conditions to list just a few. Maintaining tree vigor is the most important consideration to insuring a long life.

CONDITIONS IN BRIEF

For 1985, rainfall totals measured above normal. Spring came early as did summer and autumn. General weather conditions remained good through autumn and December. Mast production was heavy but spotty as was walnut production. The big insect occurrence in 1985 was the periodical cicada, Brood 19 of the 13 year cycle. This Brood will emerge again in 1998.

In various locations in the spring, frost injury caused damage to new growth on crabapple, shingle oak, English walnut, sweetgum, white ash, red maple and green ash. Silver maples were slow to leaf out and many had thinner than normal foliage during the growing season. Oaks exhibited less decline and Hypoxylon canker in 1985 than in 1984. Diplodia blight caused considerable damage to mature Austrian pines throughout the state. Shoot blighting and branch cankering were the most common symptoms. Pine wilt diseased caused mortality of numerous Scotch pines. Actinopelte leaf spot was the most inquired about disease during 1985. Numerous oaks statewide exhibited leaf necrosis and defoliation due to the disease. Trees with Actinopelte leaf spot were often mistakenly believed to have oak wilt.

FOREST INSECTS

Periodical Cicadas - Brood 19 of the 13 year cycle emerged in full force this May and early June over most of Missouri. The northwest corner and western tier of counties were not plagued with this insect.

European Pine Sawfly - occurred in large numbers on mugo and Scotch pine this spring wherever these species occur.

Fall Webworm - occurred in light to moderate numbers on walnut trees and other hardwood species in southwest Missouri in 1985.

Gypsy Moth - during July, August and September of 1985, twenty two male moths were recovered from traps in Missouri. Of these twenty two, one moth was collected from a trap along I-44 in Webster County, one near Gray Summitt along I-44, one near Hannibal, eighteen in St. Louis and St. Louis County and one in northwest Jefferson County. Personnel from U.S.D.A., A.P.H.I.S., PPQ furnished all traps and personnel from the Missouri State Department of Agriculture trapped and coordinated all the trapping in the state.

Insect Galls - various species of hardwood trees were infested by gall insects over the state.

Kermes Scale - again in 1985, post oaks in the St. Louis area were infested with this scale. The Henry County region also experienced infestation by this scale.

Agrilus Twig Borer - a tiny Agrilus borer infested twigs of post oak at the beginning of the new year's growth. This infestation causes flagging of the infested twigs.

Spider Mites - infestation and damage occurred statewide on spruce and other species.

Two-lined Chestnut Borer - this secondary borer developed in stressed dead and dying black and scarlet oak trees wherever these trees occured.

FOREST DISEASES

Actinopelte Leaf Spot - affected post, white, pin, Northern red, Southern red, black, willow, shingle and cherrybark oaks in a number of counties around the state. Individual trees exhibited a moderate to high level of leaf necrosis and defoliation.

Chlorotic Dwarf of Eastern White Pine - a number of Eastern white pines around the state exhibited this condition (caused by a genetically inherited sensitivity to air pollution). Affected trees were stunted and bore only current year's needles. These were chlorotic and shorter than normal, healthy needles.

Cyclaneusma Needlecast - was widespread on Scotch pine, causing a moderate loss of 1984 needles on affected trees.

Dothistroma Needle Blight - was a problem for a number of Austrian pines, especially in the northwest part of the state.

Dutch Elm Disease - was not as prevalent in 1985 as in 1984, but was widespread. Ornamental American elms were mainly affected.

Diplodia Blight - was widespread and severe on Austrian pines 25 years old and older around the state. Some mature Scotch pines in close proximity to infected Austrian pines exhibited twig blighting as a result of infection, though Scotch pines did not appear to be as severely damaged by the disease as Austrian pines.

Frost Injury - some species affected were crabapple, shingle oak, English oak, English walnut, sweetgum, white ash, red maple and green ash. Frost injury occurred in various scattered locations across the state.

Hypoxylon Canker of Oak - caused mortality of white, Northern red, black, scarlet, pin and shingle oaks. Most affected trees were in south Missouri.

Nectria Cinnabarina Canker - caused serious damage to some Bradford pears grown as ornamentals in St. Louis and Kansas City.

Oak Decline - affected white, black, pin, scarlet and Northern red oaks in 1985. Most declining oaks were located in south Missouri. The problem was not as common or as widespread in 1984 as in 1985.

Oak Wilt - pin, shingle, black and Northern red oak were species infected around the state. The disease was not as widespread or common in 1985 as in 1984.

Pine Wilt Disease - numerous Scotch pines died statewide due to pine wood nematode infection.

PROJECTS

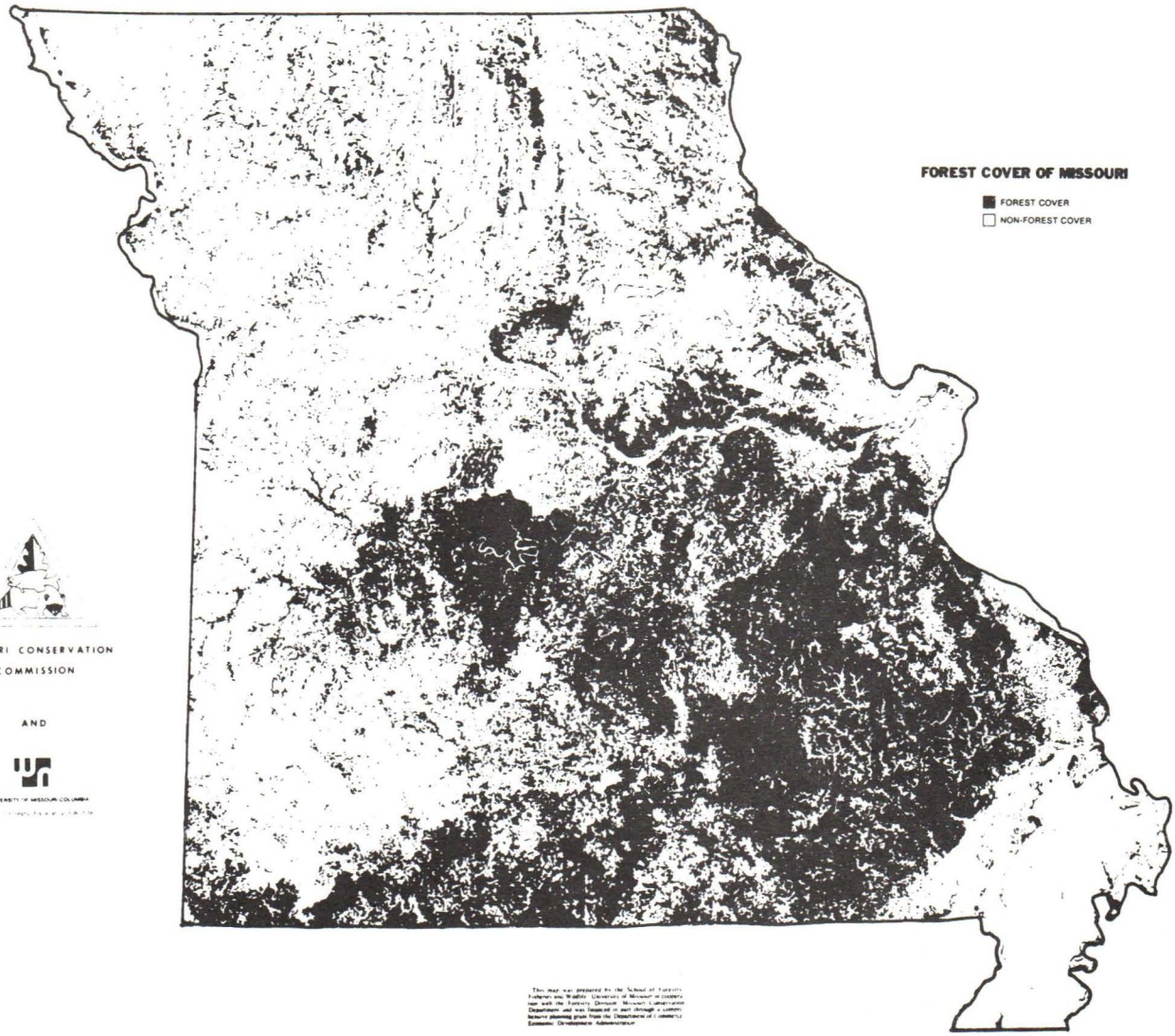
The cooperative team effort of Department Foresters and Forestry Division staff specialists resulted in a well-coordinated, successful Forest Pest Management Program in 1985. Over 3,225 forest and shade tree requests were serviced statewide in 1985. The services of staff specialists were available to foresters and others. In February and March two Pest Management sessions were held in St. Louis and Kansas City for Department Foresters and personnel associated with the green industry. These meetings were designed for arborists and urban forest pest management personnel. Over 330 people attended these two meetings. Other meetings were held throughout the state also for special interest groups. Department Foresters and staff specialists serviced over 1,700 pest related telephone calls. Over 1,000 diagnoses of tree problems were made for the state. No serious pest problems were found during visits to the George O. White State Forest Nursery.

Gass and Gowen conducted detection and evaluation surveys on the major insect and disease problems in 1985 on 5,000,000 acres. Reports were prepared and submitted to the U.S. Forest Service.

A total of four Forest Insect and Disease Status Reports (May through August) were prepared and sent to all Missouri Christmas Tree Producers, most Department personnel, and other individuals involved in tree care, totalling 1,200 copies per month.

Gass and Gowen attended the annual State Cooperators Meeting hosted by the U.S. Forest Service in St. Paul, Minnesota. Gowen attended the 1985 Meeting of the American Phytopathology Society in Reno, Nevada.

Forest Pest Management Specialists and District Foresters presented technical sessions to arborists and at regional technical seminars and conferences.


FOREST COVER OF MISSOURI
FOREST COVER
NON-FOREST COVER
MISSOURI CONSERVATION
COMMISSION
AND

HARDWOOD DEFOLIATORS

Eastern Tent Caterpillar - populations were very low during the spring of 1985. (spring was wet and cool and very early with the timing of egg hatch and leaf emergence being different than in 1984).

Trend - populations should be low in 1986.

Suppression - No control was necessary.

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Fall Webworm - populations were moderate in southwest Missouri in 1985. Infestation of black walnut, pecan, hickory, persimmon and redbud was common. The remainder of the state had low to medium levels of infestation on the same tree species.

Trend - populations should be moderate to heavy in 1986.

Suppression - various walnut and pecan growers sprayed their trees to control this insect.

****

Gall Insects - numerous reports were received statewide regarding heavy gall infestations in 1985. Gall insects (flies, wasps, psyllid gall insects and mites) are active in spring. These insects lay their eggs in succulent leaf or twig tissue where the swollen parts eventually develop. Galls commonly observed are on hickory, hackberry, and oak leaves. Elm and walnut leaves also have galls in early summer. Woody stem galls are common on oaks.

Trend - insect gall development was made more favorable this year by the succulent leaf tissue in spring. With similar conditions in 1986 we will see a repetition of 1985.

Suppression - no control was conducted for gall insects.

****

True Tree Grasshopper - this tree leaf feeding grasshopper caused light to heavy defoliation this year in Iron and Reynolds Counties. Its preferred hosts are white oak, red oak, hickory and flowering dogwood. Feeding produces a lacy appearance to foliage. It is a forest insect and suppression was not necessary.

Kermes Scale - once again this year Kermes scale was noticeable, causing twig flagging on post oak in Cass, Johnson, Pettis, Henry, St. Louis City, St. Louis County, St. Francois, St. Charles and Franklin Counties. Clusters of two to four scales attach themselves to outer twigs near the beginning of the new year's growth. The scales extract sap from beneath the bark of infested twigs.

Trend - populations should be low to moderate in 1986.

Suppression - no suppression was done for Kermes scale.

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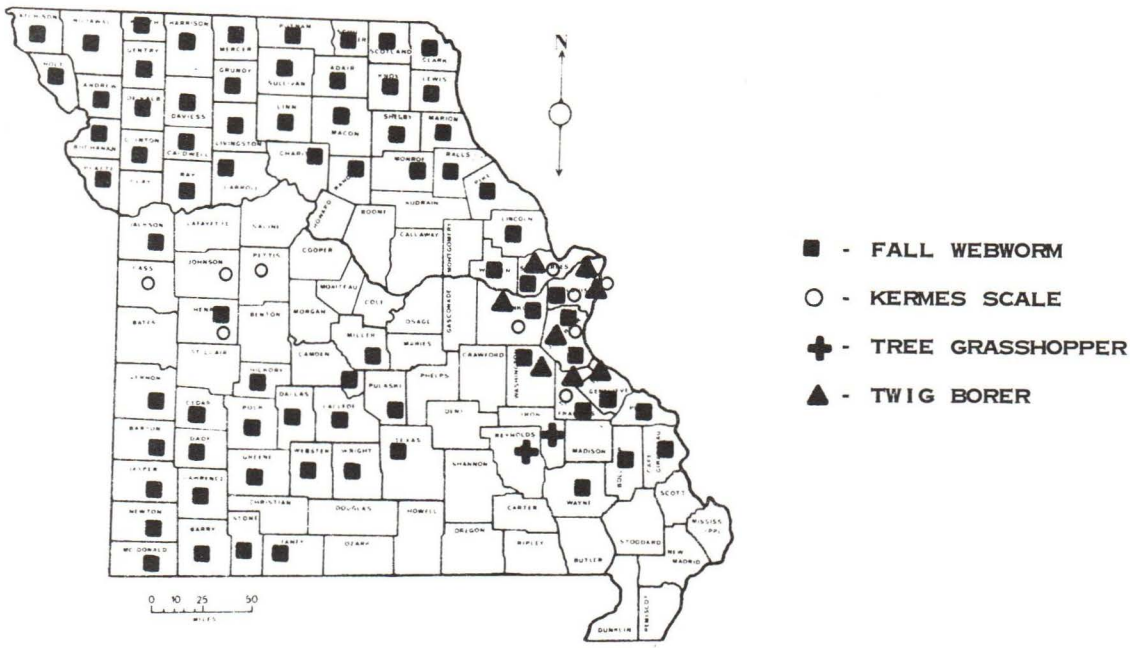

Walnut Caterpillar - populations were light to moderate over the state on black walnut pecan and hickory. Leaf feeding begins in July and ends in September. Other Datana species feed on red oak, post oak, huckleberry and sumac.

Trend - populations in 1986 will be light to moderate in most areas of the state.

Suppression - a number of nut growers sprayed their trees for this insect with an approved insecticide.

Gypsy Moth - during the summer of 1985 the gypsy moth defoliated over one and one half million acres of forest land in the northeastern United States. Defoliation increases from 1984 were experienced in almost every infested state. Spot infestations still remain in several states while infested ranges continue to spread in Michigan. Personnel of the Missouri State Department of Agriculture trapped twenty-two male moths in the St. Louis area, Franklin County, Marion County, Jefferson County and Webster County. To date, no spot infestations have been discovered in Missouri. In 1985, 4,698 gypsy moth traps provided by U.S.D.A., A.P.H.I.S; P.P.Q., were located and monitored by personnel of the Missouri State Department of Agriculture, Plant Industry Division and in cooperation with the U.S.D.A., Animal Plant Health Inspection Service. Other cooperating agencies were the Department of Natural Resources, State Parks and Historic Preservation, National Campers and Hikers Association, Corps of Engineers, and John Grinstead at Fort Leonard Wood.

The gypsy moth is not native to the United States, however, its life cycle does parallel that of a number of other native insects. In spring and early summer, larvae feed on a great variety of hardwood foliage. With three repeated defoliations of hardwood, tree mortality can occur. One defoliation can kill evergreen trees such as cedar or pine.

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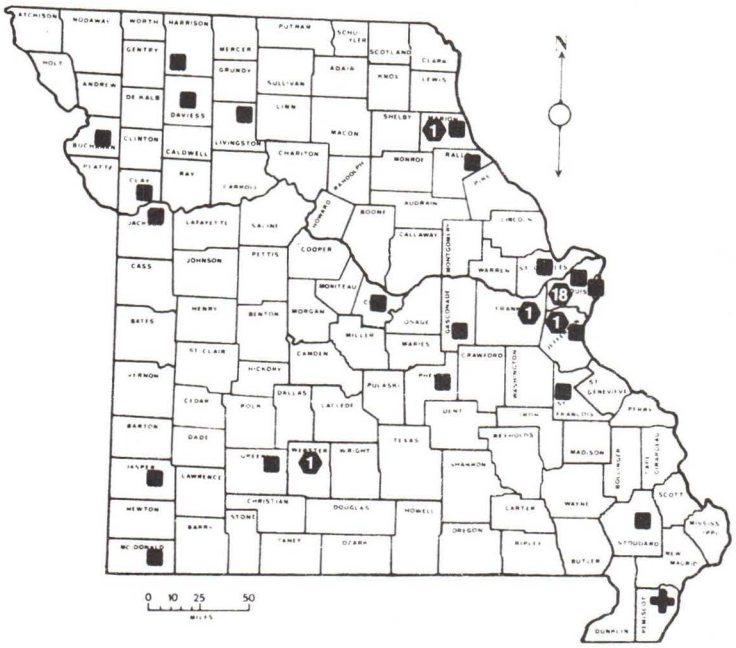

■ - SPIDER MITES

✚ - COTTONWOOD LEAF BEETLE

⬢ - GYPSY MOTH

Looper Complex - although defoliation was low to moderate this group of insects was represented in about forty counties in eastern Missouri. (see distribution map) The term looper complex is used to describe five different insects which emerge and feed on a variety of hardwood foliage at the same time of the year. Common loopers are the Linden Looper, elm spanworm, Spring cankerworm, leaf roller and leaf tier. It may take four or five years for looper complex populations to build to a heavy level. Predators and parasites usually are responsible for the collapse of large populations of the looper complex.

Trend - populations likely will build slightly in 1986 from 1985.

Suppression - no suppression work was done in 1985.

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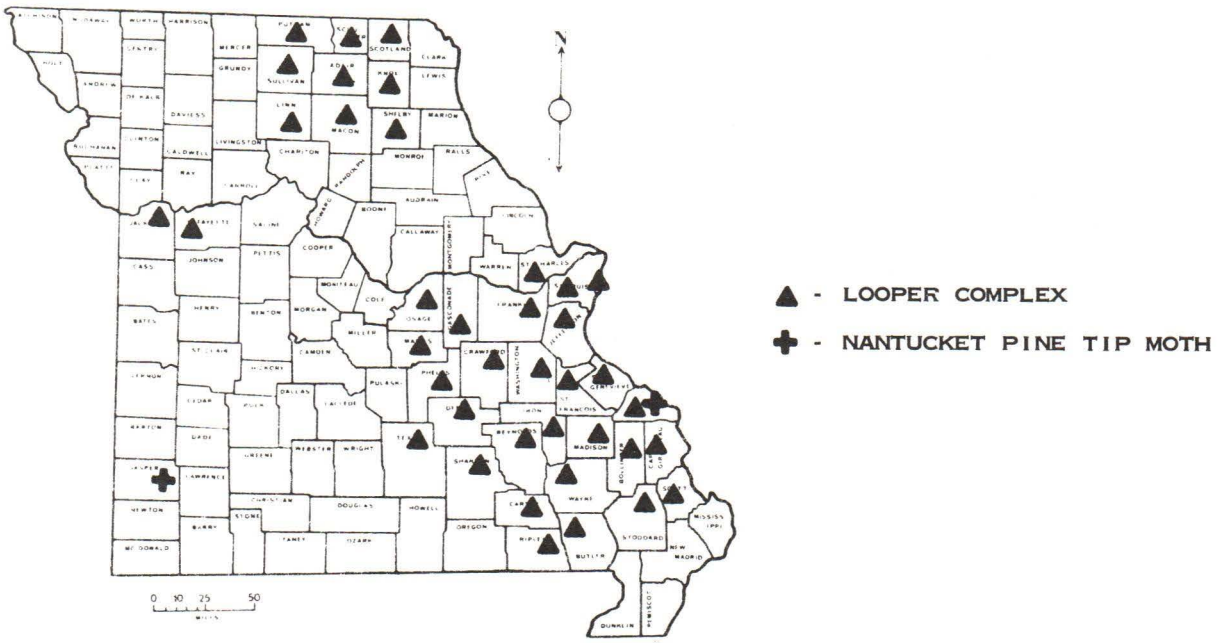

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HARDWOOD BORERS

Agrilus Twig Borer - for the last several years a tiny Agrilus borer has infested the tip end of the previous years growth of post oak. When the new growth begins in spring the borer restricts movement of materials to the end of the new growth causing flagging or browning of the leaves prematurely. This insect was especially active on post oak in eight counties in east central Missouri. As alarming as this damage appears, no tree mortality results from infestation.

Trend - populations could build in post oak twigs in 1986.

Suppression - no suppression is feasible for this insect.

****

The Carpenterworm and Red Oak Borer - and other living hardwood tree borers as part of our endemic, indigenous borer populations continue to infest hardwood trees in forested areas of the state. Hardwood borers are a major problem on many hardwood trees in urban areas.

Trend - Borer infestation will continue in hardwood trees occupying poorer sites. Estimated dollar loss to the hardwood borer complex amounts to $2,000,000 annually through lumber degrade and ornamental tree loss.

Suppression - selective tree harvest, sanitation harvest and stand conversion from hardwood to pine were conducted in forested areas over the state. Some shade tree owners controlled borer infestations on high value trees.

****

The Cottonwood Twig Borer, Cottonwood Borer, Cottonwood Leaf Beetle and Poplar Tent Maker - continue to infest cottonwood where it grows. Borer damage is greater in trees growing on poor sites. Defoliation by the Poplar Tent Maker occurs almost everywhere cottonwood grows. In 1985 the cottonwood leaf beetle occurred in large enough numbers in a 20 acre clonal test of cottonwood to require two sprayings of Sevin in New Madrid County. Personnel of the Poplar Bluff Forest District coordinated this spraying both times with the aerial spray contractor.

Trend - No increase in infestation is anticipated in 1986. the cottonwood clonal test should be checked again in June, 1986, for presence of the cottonwood leaf beetle.

Suppression - with the exception of the spraying of 20 acres for the cottonwood leaf beetle, no other control work was conducted.

****

Two-lined Chestnut Borer - the two-lined chestnut borer is not a primary attacker of live healthy trees. It is a secondary attacker of stressed black and scarlet oak as well as shingle oak. It plays a role along with various root rots and Hypoxylon canker in finally killing stressed oak trees. Beginning in 1978, and through 1980, moisture was a limiting factor for tree growth, triggering attacks by the two-lined chestnut borer and root rots. In 1983 and 1984, drought conditions prevailed from late June through September over most of the state. As a result of the effects of drought, many more oak trees were lost. Other tree stressing factors are late frosts, poor sites and spring defoliating insects.

Trend - without the adequate summer rainfall, oak trees will continue to be stressed. Oak trees will continue to die as long as rainfall is deficient during the most critical growing period. Tree mortality will continue for several years as a result of the dry period from 1976 to 1984. To a degree, 1985 was relatively moist thus relieving the drought stressed condition of Missouri's trees.

Suppression - Drought hazard sites must be recognized and managed in such a manner as to pay attention to species composition. Alternatives to even-aged management and conversion to shortleaf pine where hardwood basal is too low should be considered. On marginal hardwood sites the entomological and pathological rotation should be used rather than a fixed rotation age.

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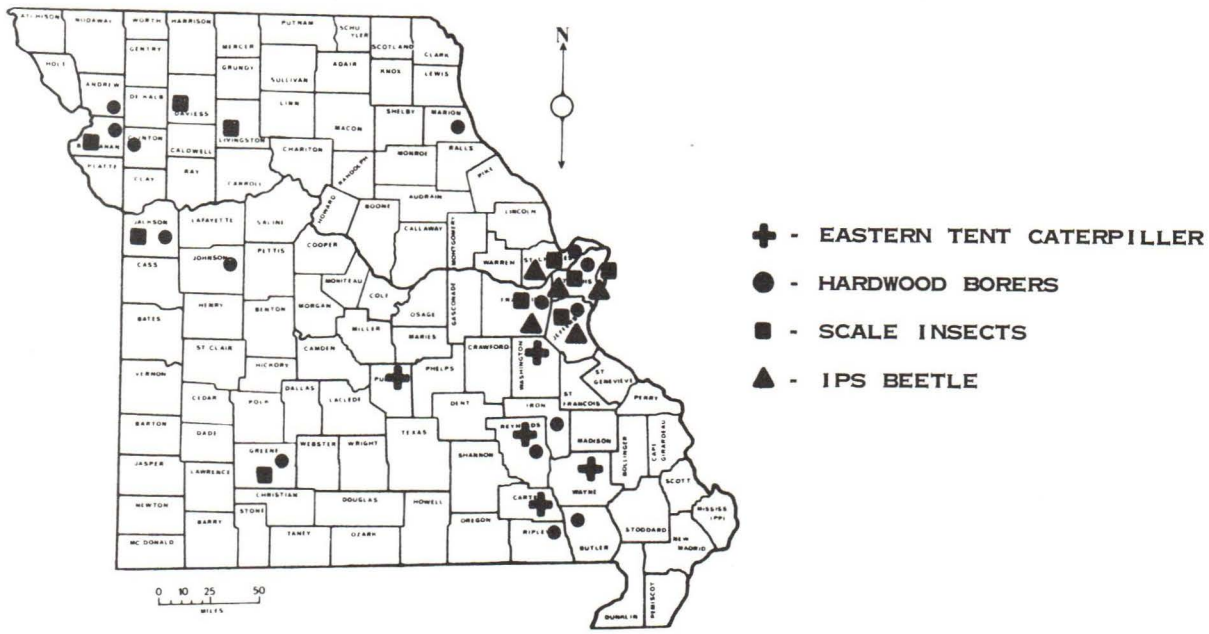
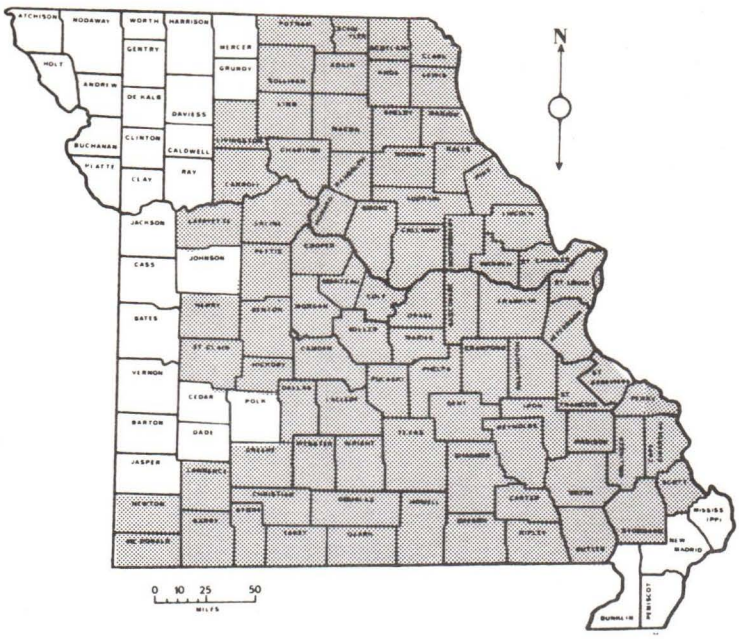


Periodical Cicada - Brood 19 of the 13 year cycle of the periodical cicada appeared in May and June. There are certain insects that are termed nuisance insects. This was such an insect. Simply because of its presence in large numbers and the eerie noise that it produced; it was a nuisance to many people. Even with all of the advanced publicity, we received many inquiries about it. Although the cicada causes very minor lasting damage to trees and shrubs, we received a surge of telephone calls as the ends of limbs began dying and leaves browning in July and August. This was caused by egg ovipositing in the tender bark of twigs.

Trend - this brood will not emerge from the soil until 1998.

Suppression - it was not feasible to do any control work for this insect.



- PERIODICAL CICADAS

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PINE AND CEDAR TRUNK BORERS, TWIG BORERS AND DEFOLIATORS

Black Turpentine Beetle - light infestations were reported from Reynolds and Douglas counties in 1985. The black turpentine beetle infests weakened shortleaf pine trees - those damaged in a timber sale, damaged during building construction, windthrown or those struck by lightning. Once the infestation has proceeded and is successful, the Ips beetle can also develop, completing the process of killing the tree.

Trend - beetle populations will develop where shortleaf pine trees are disturbed either naturally or artificially.

Suppression - where feasible, attacked trees are removed as timber cutting progresses in timber sale areas.

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European Pine Sawfly - populations were very large this year with defoliation being moderate to heavy on Scotch and mugo pines in forty counties in the state. Affected trees were grown for ornamental or Christmas Tree purposes.

Trend - population levels will be moderate to heavy again in 1986.

Suppression - a number of Christmas Tree producers and homeowners sprayed their trees and shrubs for the European pine sawfly.

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Evergreen Bagworm - infestations of bagworms were light to moderate on Eastern redcedar and upright pfitzer junipers over the state. Very seldom is defoliation complete, but large numbers of bagworms on a plant can kill it in one to two years.

Trend - Bagworms will continue to threaten unsprayed ornamental evergreens. Populations are expected to be light to moderate statewide in 1986.

Suppression - some owners of evergreens had their shrubs sprayed by tree service companies.

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Ips Beetle - is a weak attacker of live, healthy shortleaf pine trees. It is most usually detected on very stressed pines and pines that have infestations of black turpentine beetles. If new pine slash is created, Ips often infests this slash and will later infest live healthy neighboring pine trees. Ips was reported from several counties in 1985.

Trend - Ips will occur wherever stressed shortleaf pine grows.

Suppression - in high value pine stands, sanitation of infested pine trees was conducted.

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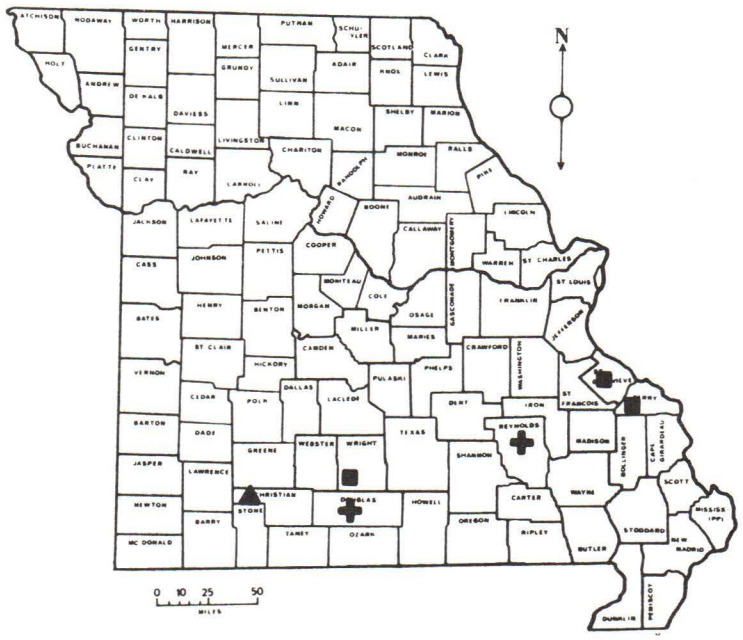

✚ - BLACK TURPENTINE BEETLE

■ - REDHEADED PINE SAWFLY

▲ - PINE TORTISE SCALE

Loblolly Pine Sawfly - populations were light in 1985. This is an early summer feeder on shortleaf and Scotch pines, however, one or several factors such as a cold January and February and parasitism held populations low again this year.

Trend - populations should be very low in 1986.

Suppression - no controls were required.

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Pale Weevil - populations were very low in 1985. Infestations were reported for three counties where feeding and flagging occurred in Christmas tree plantations.

Trend - populations should be light in 1986.

Suppression - no suppression was required this year. Our standard control recommendation is to spray stumps produced during the previous Christmas with Thiodan and diesel fuel in March of the following year. Unless growers already have the problem they usually don't take control measures to prevent possible weevil buildups for the following year.

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Pine Needle Scale - populations increased on Scotch and mugo pine needles in nine counties in 1985. Scales build up on needles in such large numbers that the plant appears to be whitewashed. Present infestations are at the level where only small groups of trees or shrubs are infested, however, there is the potential for greater spread of the scale to other plants.

Trend - populations appear to be growing and should be heavier during 1986.

Suppression - Several growers sprayed individual and selected trees and shrubs for control of the pine needle scale.

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Redheaded Pine Sawfly - populations were low in 1985, being reported from three counties in south Missouri. Defoliations were light to moderate on just a few trees in each planting affected.

Trend - populations in 1986 will remain low.

Suppression - no suppression was carried out.

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Spider Mites - populations of a variety of species of spider mites infested spruce, scotch pine, bald cypress and certain other species in 1985. Hot and dry summers make ideal feeding conditions for most species of spider mites on needles of coniferous trees. Feeding by spider mites produces a light-green color to the needles. Upon closer examinations, egg cases, mites and webbing can be observed on infested plant material material.

Trend - spider mite damage will be heavy again in 1986. Although feeding seldom directly kills trees, it does stress them and damages the aesthetic value of Christmas trees or ornamental plants.

Suppression - arborists use Kelthane as a standard miticide to control the various species of spider mites. Christmas tree producers spray their Scotch pine trees for spider mites as the problem occurs.

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Pine Tortise Scale - infested a Christmas tree plantation near Springfield, MO in 1985. This insect does not normally become epidemic in a planting because of natural predation by lady beetles and predaceous bugs. Only larger, scattered trees over the plantation were affected.

The trees were heavily infested with scale on the small twigs. The infestation was detected by the presence of large concentrations of honeydew which had molded, imparting a black cast to the entire tree.

Trend - populations will build only slightly in 1986.

Suppression - The Christmas tree producer was advised to spray a dormant oil on only those trees infested prior to winter. If required, he will also spray these trees with Sevin in late May of 1986 to control the crawler stage of the scale.

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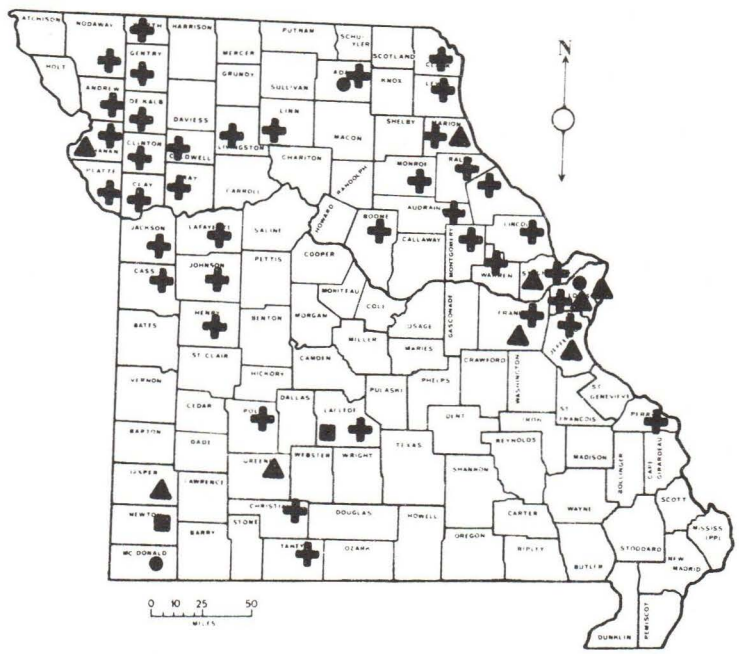
● - PALES WEEVIL

✚ - EUROPEAN PINE SAWFLY

▲ - PINE NEEDLE SCALE

■ - LOBLOLLY PINE SAWFLY



FOREST AND ORNAMENTAL TREE DISEASES

Actinopelte Leaf Spot of Oak - was widespread on white, pin, Northern red, Southern red, black, willow, post, shingle and cherrybark oaks in 1985. Individual trees exhibited moderate to high levels of leaf necrosis and defoliation.

Trend - in recent years the disease has been endemic, with scattered trees affected to varying degrees. In 1985 the disease appeared to have become epidemic, with numerous oaks exhibiting foliage browning. The disease was often mistakenly believed to be oak wilt and infected trees were often believed to be dying, which may have resulted in the unnecessary harvesting of some forest and ornamental trees. Actinopelte leaf spot will probably continue to be the most important foliage problem of oaks in Missouri for the next few years.

Suppression - since most foliage injury occurs during late summer and fall, infected trees are not badly stressed and usually put out normal foliage the following spring. Control of the disease is not usually attempted.

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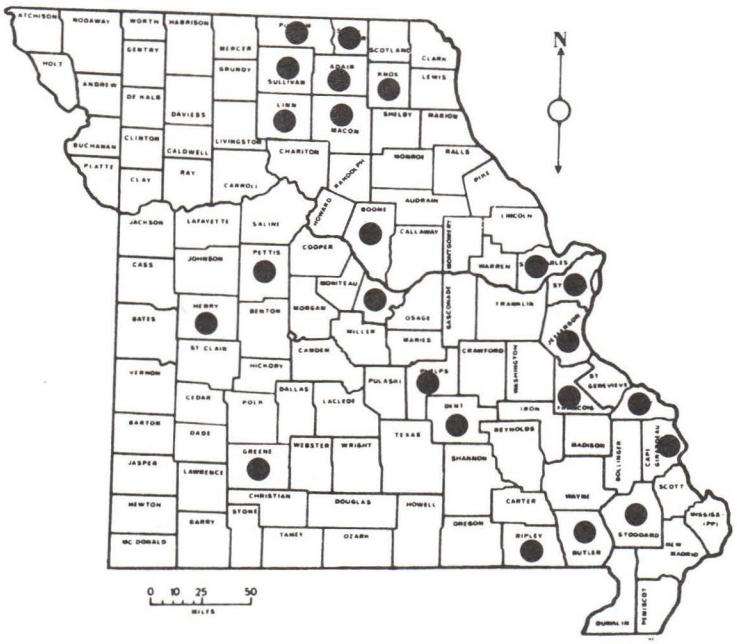
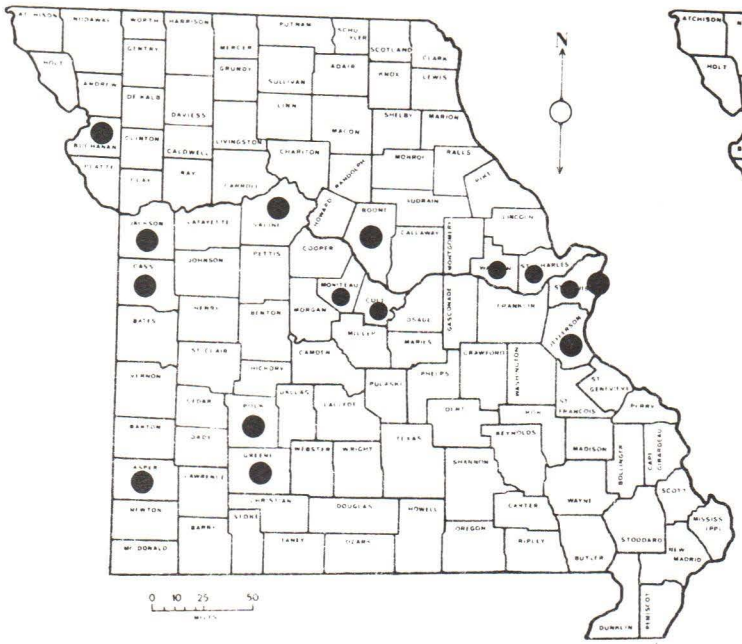


● - ACTINOPELTE LEAF SPOT OF OAK

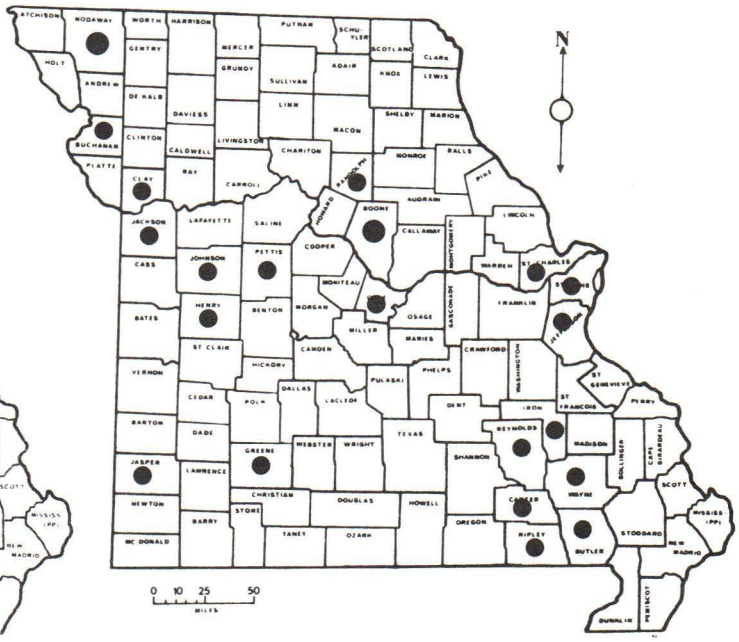
Diplodia Blight - was a major cause of shoot and branch dieback of mature Austrian pines (25 years old and older). Some mature Scotch pines also exhibited shoot dieback. The disease was widespread.

Trend - Diplodia blight is endemic in Missouri. Numerous mature Austrian pines and mature Scotch pines in close proximity to diseased Austrian pines can be expected to be infected in the future.

Suppression - dead and dying pines are removed on an individual basis. Benomyl and Bordeaux mixture are fungicides used in large urban areas for control.



● - DIPLODIA BLIGHT



● - DUTCH ELM DISEASE

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Dutch Elm Disease - The disease was widespread but not as prevalent in 1985 as in 1984. Both forest and ornamental American elms were affected.

Trend - Dutch elm disease is endemic in the state. Continued losses of American elms can be expected to occur in the future.

Suppression - Dead and dying elms are removed on an individual basis. Chemical injections are used to treat individual high-value elms, but are not a common treatment.

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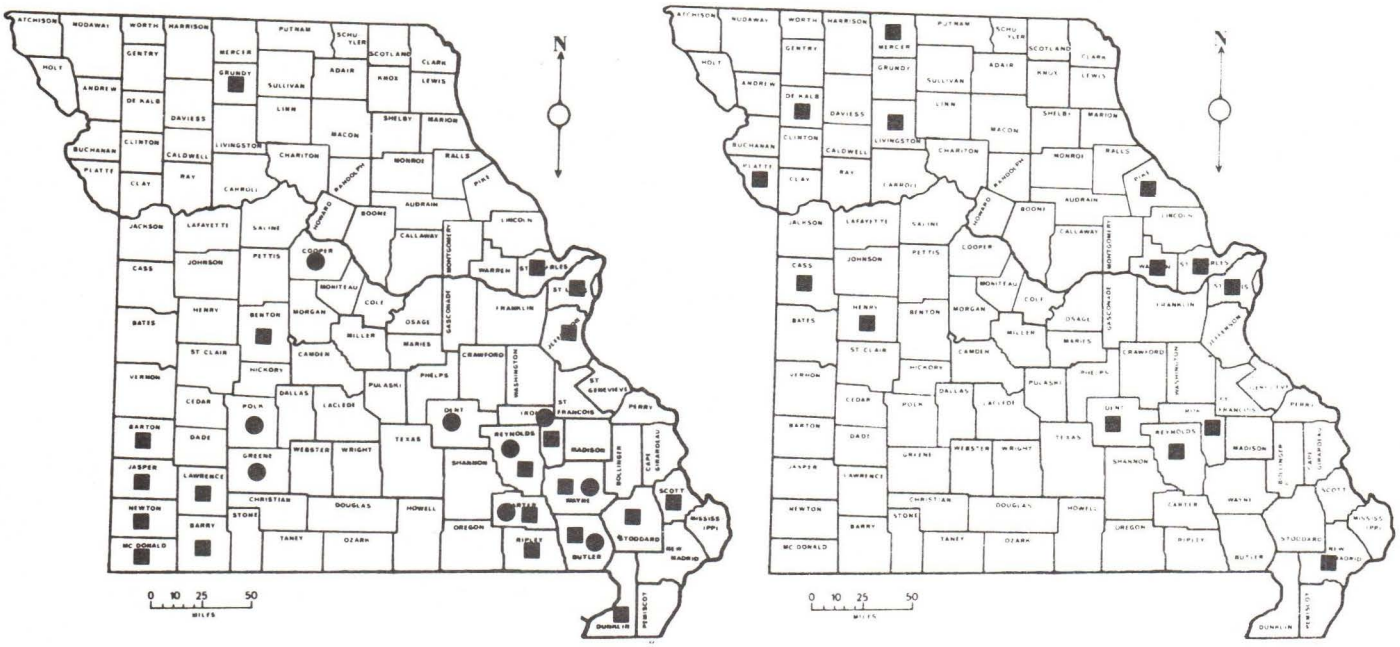
Oak Decline and Hypoxylon Canker - white, Northern red, black, scarlet, pin and shingle oaks were affected in 1985. Scattered forest and ornamental oaks were subject to decline and Hypoxylon canker. Fewer trees were affected in 1985 than in 1984.

Trend - the droughts of 1980, 1983, and 1984 stressed many oaks and made them susceptible to Hypoxylon canker and attacks by other secondary agents. The incidence of oak decline and Hypoxylon canker is expected to decrease if adequate rainfall is received in the future.

Suppression - dead and dying oaks were removed on an individual basis.



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Oak Wilt - pin, shingle, Northern red and black oak were species infected in 1985. Scattered forest and ornamental trees were subject to the disease.

Trend - Oak wilt is endemic in Missouri. Scattered forest and ornamental trees can be expected to become infected in the future. No large scale mortality of oaks is expected to result from oak wilt.

Suppression - it is recommended that pruning of oaks be performed either in winter (while trees are dormant) or late summer, to help avoid attracting insects which could carry spores of the oak wilt fungus. Dead and dying oaks are removed on an individual basis.

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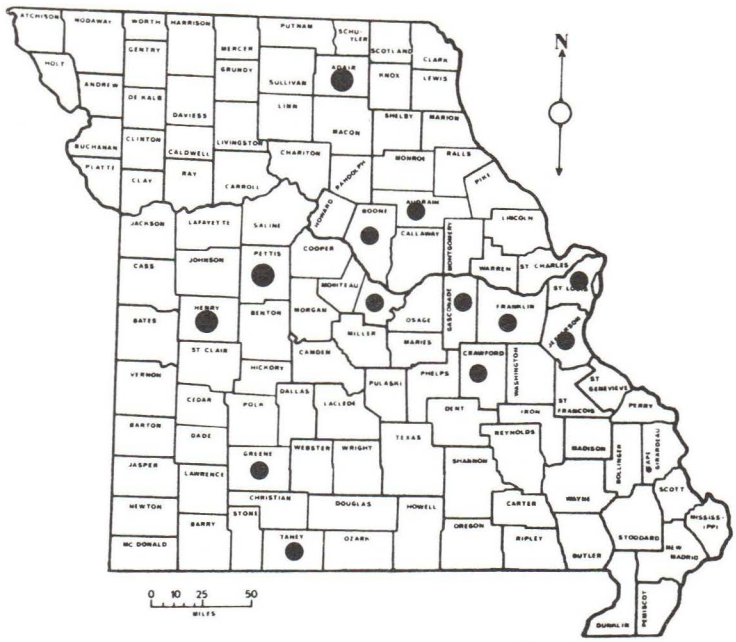
Pine Wilt Disease - the disease caused mortality of numerous Scotch pines throughout the state in 1985.

Trend - Pine wilt disease is endemic in the state. Continued losses of Scotch pine can be expected in the future. Scotch pines seldom live longer than 25 years in Missouri due to pine wilt disease and other factors.

Suppression - dying and diseased pines are removed on an individual basis.



● - PINE WILT DISEASE

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CONCLUSION

We were fortunate to receive adequate amounts of rainfall during 1985. Although a dry period occurred in July and August, trees didn't suffer as they had in the previous summers of 1983 and 1984. Conditions were favorable in spring for the build up of leaf and needle diseases during middle and late summer. In certain areas of the state, leaf scorch was a problem.

We completed our fourth season with the Integrated pest Management Program (IPM) with the University of Missouri-Columbia. This multi-state reporting program has been developed to collect and computerize pest occurrence data for most economic plant pests in the state. Forestry Division is reporting results to the IPM program for incidence of diseases and insects on forest and ornamental trees.

Because of our field forester's reports we have been able to collect and assemble this statewide pest incidence information.

Cooperation and team effort has always been our key to a successful Forest Pest Management Program.

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INSECT-HOST	COUNTY
Agrilus Twig Borer (post oak)	Statewide
Bagworms (on evergreens)	Statewide
Black Turpentine Beetle (shortleaf pine)	Douglas, Reynolds
Borers (hardwood trees)	Andrew, Boone, Buchanan, Butler,Clinton, Franklin, Greene, Iron, Jackson, Jefferson, Johnson, Marion, Reynolds, Ripley, St. Charles, St. Louis, St. Louis City
Bronze Birch Borer(white birch)	Statewide
Eastern Tent Caterpillar(Prunus sp.)	Statewide
European Pine Sawfly(Scotch and mugo pines)	Adair, Andrews, Audrain, Boone, Buchanan. Caldwell, Cass, Clinton, DeKalb, Franklin, Gentry, Henry, Jackson, Jefferson, Johnson, Laclede, Lafayette, Lewis, Lincoln, Linn, Livingston, Marion, Monroe, Nodaway, Perry, Platte, Polk, Ralls, Ray, St. Charles, St. Louis City, St. Louis County, Taney, Warren, Worth

Fall Webworm (on black walnut other hardwood species)	Statewide, where host species occur
Gall Insect (assorted hardwoods)	Statewide
Gypsy Moth (in traps)	Franklin, St. Louis and Webster
Ips (shortleaf and white pine)	Franklin, Jefferson, St. Charles, St. Louis City, St. Louis County
Kermes scale (post oak)	Cass, Franklin, Henry, Jefferson, Johnson, Pettis, St. Charles, St. Francois, St. Louis City, St. Louis County
Looper Complex (assorted hardwoods)	Adair, Bollinger, Butler, Cape Girardeau, Carter, Crawford, Dent, Franklin, Gasconade, Iron, Jackson, Jefferson, Knox, Lafayette, Lincoln, Linn, Macon, Madison, Maries, Osage, Perry, Phelps, Putnam, Reynolds, Ripley, Schuyler, Scotland, Scott, Shannon, Stoddard, Shelby, Sullivan, St. Charles, St. Francois, Ste. Genevieve, St. Louis City, St. Louis County, Texas, Washington, Wayne
Loblolly Pine Sawfly (shortleaf pine)	Laclede, Newton
Pales Weevil (Scotch pine)	Adair, Newton
Periodical Cicada(mixed species)	Statewide, minus northwest and west tier of counties
Redheaded Pine Sawfly (shortleaf pine)	Perry, Ste. Genevieve, Wright
Scale Insects (on hardwoods)	Buchanan, Daviess, Franklin, Greene, Jackson, Jefferson, Livingston, St. Charles, St. Louis City, St. Louis County
Scale Insects (Scotch and mugo pine)	Buchanan, Christian, Franklin,Greene, Jasper, Jefferson, Marion, St. Charles, St. Louis City, St. Louis County

Spider Mites (mixed conifers)	Buchanan, Clay, Daviess, Franklin, Gasconade, Greene, Harrison, Henry, Jasper, Jefferson, McDonald, Marion, Phelps, Ralls, St. Charles, St. Louis City, St. Louis County
True Tree Grasshoppers(hardwoods)	Iron, Reynolds
Two-lined Chestnut Borer(oak)	In counties with stressed oak trees - Statewide
Walking Stick (hardwoods)	very light in south Missouri forests
Walnut Caterpillar (walnut, pecan, hickory)	Statewide where hosts species grow

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PEST AND HOST	COUNTY
Actinopelte Leaf Spot (white, post, pin, black, willow, shingle, cherrybark, Southern red and Northern red oak)	Putnam, Sullivan, Linn, Schuyler, Adair, Macon, Scotland, Knox, Phelps, Perry, Henry, St. Charles, St. Louis, Jefferson, St. Louis City, Butler, Ripley, Cape Girardeau, Pettis, Greene, Cole, Boone, Stoddard, Dent
Anthracnose(ash sp., white ash)	Cole, Henry
Anthracnose (hickory)	Perry
Anthracnose (sugar maple)	Perry, Buchanan
Anthracnose (white, post, pin and red oak)	Perry, Greene, Buchanan
Ash Decline (green ash)	St. Louis City, St. Louis, St. Charles, Jefferson
Black Knot (purple leaf plum, plum sp.)	Clay, Cole
Bleeding Canker (maple species)	Boone
Brown-Spot Needle Blight (Scotch pine)	Buchanan, Greene, Nodaway, Johnson, Morgan, Boone

Chlorosis (pin oak)	Buchanan
Chlorosis (sweetgum)	Greene
Chlorotic Dwarf (Eastern white pine)	St. Louis, Johnson, Howard
Coryneum Twig Blight (black and post oak)	Stoddard, St. Louis
Cyclaneusma Needlecast (Scotch pine)	St.Charles, Jefferson,St.Louis City, St. Louis, Adair, Greene, Ripley, Texas, Buchanan, Boone,Saline, Howard, Randolph, Audrain, Callaway, Cooper, Moniteau, Cole, Cass, Cape Girardeau
Diplodia Blight (Austrian and Scotch pine)	St. Louis City, St. Louis, Jefferson, St. Charles, Buchanan, Greene, Polk, Boone, Jackson, Saline, Cass, Warren, Jasper, Moniteau, Cole
Dothistroma Needle Blight (Austrian Pine)	Buchanan, Jackson, Platte, Cass, Calloway
Dutch Elm Disease (American elm)	Pettis, Jackson, Wayne, Greene, St. Charles, St. Louis, Jefferson, Nodaway, Butler, Ripley, Carter, Henry, Boone, Clay, Iron, Reynolds, Johnson, Randolph, Buchanan, Jasper, Cole
Fireblight (black cherry)	Wright
Frost Injury (crabapple, shingle oak, English walnut, sweetgum, white ash, red maple, green ash)	St. Louis, Greene, Moniteau, St. Francois, Henry, Greene, Boone
Gymnosporangium Branch Swelling (Eastern red cedar)	Texas
Hypoxylon Canker (white, black, Northern red, scarlet, pin and shingle oak)	St. Charles, St. Louis, Jefferson, Iron, Reynolds, Carter, Wayne, Butler, Dunklin, Ripley, Scott, Stoddard, Livingston, Barton, Barry, Jasper, Newton, McDonald, Benton, Lawrence

Kabatina Blight (Eastern red cedar)	Miller
Maple Leaf Blister (Silver maple)	Callaway
Maple Decline (sugar maple)	Buchanan, Texas
Nectria Cinnabarina Canker (Greenspire linden, Bradford pear, sugar maple)	St. Louis, Jackson
Needle Tip Burn (Eastern white pine)	St. Louis, Boone, Howard
Oak Decline (white, scarlet, Northern red, pin and black oak)	Wayne, Carter, Cooper, Iron, Greene, Butler, Dent, Polk, Reynolds
Oak Leaf Blister (white oak)	Cole, St. Francois
Oak Wilt (pin, shingle, black and Northern red oak)	Livingston, Platte, DeKalb, St. Charles, Mercer, Iron, Henry, Warren, Pike, Cass, St. Louis
Phomopsis Blight (juniper sp.)	Greene
Phyllosticta Leaf Spot (silver and red maple)	Cole
Pine Wilt Disease (Scotch pine)	Gasconade, Franklin, Boone, Pettis, St. Louis, Adair, Audrain, Taney, Crawford, Greene, Cole, Henry, Jefferson, St. Charles
Rhizosphaera Needlecast (white and blue spruce)	Greene, Boone
Sapsucker Injury (shortleaf pine, crabapple)	Phelps, St. Louis
Steganosporium Canker (black and sugar maple)	Greene, Butler, St. Louis
Tar Spot (maple sp.)	Butler, Ripley, Stoddard